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Division of Equipment

[Equipment Quality Standards -- WELDING](#)

Purpose – This is one of a series of documents intended to clarify minimum quality standards required by the Division of Equipment for the Caltrans vehicle fleet.

Scope – This Caltrans Division of Equipment draft standard sets forth the quality requirements for the welding process and final weld product. The standard applies to all structural welds used in the manufacture of equipment, vehicles, trailers and components for the Caltrans fleet. It places no restriction on any welding process or procedure, provided the weld produced meets the qualification requirements called out in the standard.

Revision Date - December 20 , 2004

Chapter	Topic
1	References, Terminology and Symbols
2	Design, Workmanship and Welding Quality
3	Inspection
4	Visual Examples
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	Prior Revision (July 16, 2002)

1. References, Terminology and Symbols

References - The following are American Welding Society (AWS) standards approved by the American National Standards Institute (ANSI):

- AWS A2.4 "Standard Symbols for Welding, Brazing, and Nondestructive Examination"
- AWS A3.0 "Standard Welding Terms and Definitions"
- ANSI/AWS B1.11:2000 "Guide for the Visual Examination of Welds"

- ANSI/AWS D14.3-94 "Specification for Welding Earthmoving and Construction Equipment"
- ANSI/AWS D14.4-97 "Specification for Welded Joints in Machinery and Equipment"

Refer to the current issue at time of bid solicitation.

- Boats and aquatic craft used by Caltrans shall meet the A.B.Y.C "Standards and Technical Information Reports for Small Craft".

Terminology & Definitions -

The terminology and definitions in this standard and Caltrans specifications and drawings shall be interpreted in accordance with the terminology and definitions in the referenced publication AWS A3.0.

Weld Symbols -

The weld symbols used in Caltrans drawings conform to the symbols in referenced publication AWS A2.4. Caltrans weld symbols are listed in [Table A](#).

2. Design, Workmanship and Welding Quality Requirements

Weld design, preparation, procedures, materials, and quality shall conform to ANSI/AWS D14.3-94 and ANSI/AWS D14.4-97.

Welded joint design shall be per ANSI/AWS standards as described in referenced publications AWS-D14.3 and AWS D14.4.

Although certified welders are not required, it is expected that the final weld quality will be equivalent to a weld made by a certified welder.

Drawings contain one or both of the following notes:

1. ALL JOINTS TO BE WELDED CONTINUOUS UNLESS OTHERWISE SPECIFIED. SIZE OF ALL WELDS TO BE AT LEAST THE THICKNESS OF THE THINNER OF THE ADJACENT METALS. WELDS TO BE UNIFORM AND NEAT IN APPEARANCE.
2. THE WORK SHALL BE POSITIONED FOR FLAT WELDING WHENEVER POSSIBLE. USE PROPER PROCEDURES AND SEQUENCE OF WELDING TO AVOID NEEDLESS DISTORTION AND MINIMIZE SHRINKAGE STRESSES OF THE ASSEMBLY.








3. Inspection





These notes are intended to provide practical guidelines for good workmanship. They are not intended as a substitute for weld design preparation, procedures, materials and quality as provided by the referenced standards.

The State of California Quality Assurance Inspection will conform to the contents of [Table B](#) and guidelines and recommendations covered in reference publication AWS B1.11:2000. Table B contains a list of the most common weld defects and the criteria they shall be judged with for acceptance.




4. Examples

Rear Crossmembers -




<p>Photograph series of the desired installation method.</p> <p>Method: Three pass minimum, vertical weld shall be uphill only, single pass on interior corners.</p>		
		
Crossmember and gusset tacked in place.	Ends of material exposed to provide sufficient weld area.	The first or root pass.
		
Root pass detail.	Penetration on inside of welded corner.	Second pass.

		
Second pass detail.	Third and final pass.	Third pass detail -- Note the even surface, regular spacing, and excellent blending of weld to parent material.
		
Single pass inside crossmember.		





"D"-Rings

<p>Photographs showing weld quality.</p> <p>Method: Three pass weld with wrap-around on ends.</p>		
		
Three pass weld with wrap-around on ends.	Three pass weld with wrap-around on ends, closeup.	

Body Shear Plate Mounts

<p>Photographs of preparation and final pass.</p> <p>Method: Two pass weld. Vertical welds shall be uphill only.</p>		
		
Typical preparation.	Final weld.	

Body Hinge Plate

<p>Photograph series of desired installation method.</p> <p>Method: Two pass weld. Vertical welds shall be uphill only.</p>		
		
Preparation.	First pass.	Cover pass.

Body Telescoping Hoist Mount

Method: Three passes required.



Body Sill to Hinge Blocks

Photograph series of desired installation method.

Method: 3 passes all the way around.



Surfaces to be welded shall be thoroughly cleaned.



First pass. Apply weld deep in root.



First pass. Note penetration.





Second pass. Apply weld to first pass and one of the parts being joined.



Third pass. Apply weld to second pass, first pass and part not joined by second pass.



Fourth pass optional: applied to pass #2 and #3 and both parts being joined.

		
Final product. Weld is applied around four sides fo hinge blocks.	Final product. Weld is applied around four sides fo hinge blocks.	

Hydraulic Tanks

<p>Applies to all fluid tanks.</p> <p>Method: Single pass. NO GRINDING OF WELD.</p>		
		
Tic weld initial setup.	Grind before final pass.	Exterior Final Weld.